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2079

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION.

A Process for the Preparation of Formaldehyde or its Polymers from Mixtures of Carbon Monoxide and Hydrogen.

I, ERNEST JOSEPH LUSH, of 4, Milner Street, London, S.W. 3, British Subject, do hereby declare the nature of this invention to be as follows:—

When a mixture of carbon monoxide and hydrogen in suitable proportions such as may be obtained by the purification of "suction" and water gas is passed over suitable catalysts, several valuable products can be produced from the gas mixture.

I have found that when such gas mixtures are passed over a compound catalytic mass of a hydrogen activating nature such as nickel and copper and hydrating nature such as alumina, large yields of formaldehyde, together with liquid and solid condensation products thereof, are produced. This yield may be moreover increased by passing a rapid current of the gas mixture over the catalysts, and subsequent rapid cooling, whereby complete reduction of methane is lessened and decomposition of the formaldehyde prevented.

By one method of carrying out my invention I prepare a suitable catalyst mixture of pieces of about the size of lead shot or peas and rapidly pass the gas, preferably under pressure, through a tube packed with the catalyst the gases issuing from a small constriction thus promoting cooling on passing into suitable scrubbers for the purpose of removing the formaldehyde. The residual gas, after washing, contains a large percentage of methane and hydrogen, and a correspondingly small percentage of carbon monoxide and is therefore of commercial value as an illuminating gas. By the adoption of the aforesaid process and the incidental purification of the gas and consequent enhanced value thereof the cost of production of the formaldehyde and its condensation and polymerisation products is materially lessened.

As an example of a suitable catalyst I have used a mixture of 4 parts nickel 1 part copper and 5 parts alumina. It is understood that other metals may replace the nickel or copper and other oxides, especially the rare earths, may replace alumina. Moreover according to the conditions of temperature, rate of flow of gas and nature of catalysts used, the formaldehyde can be obtained polymerised according to the many well-known forms in which formaldehyde is known to condense.

Dated this 12th day of February, 1921.

E. J. LUSH,
Per W. H. Beck & Co.,
Chartered Patent Agents,
115, Cannon Street, London, E.C. 4.

COMPLETE SPECIFICATION.

A Process for the Preparation of Formaldehyde or its Polymers from Mixtures of Carbon Monoxide and Hydrogen.

I, ERNEST JOSEPH LUSH, of 4, Milner Street, London, S.W. 3, British Subject, do hereby declare the nature of this invention and in what manner the same

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is to be performed, to be particularly described and ascertained in and by the following statement:—

When a mixture of carbon monoxide and hydrogen in suitable proportions such as may be obtained by the purification of "suction" and water gas respectively is passed over suitable catalysts, several valuable products can be produced from the gas mixture.

I have found that when such gas mixtures are passed over an intimate mixture of a hydrogen activating catalyst such as nickel and/or copper and hydrated metal oxide such as alumina large yields of formaldehyde, together with liquid and solid condensation products thereof are produced. In order to maintain the activity of the catalyst steam is introduced into the reaction vessel as hereinafter described. This yield may be moreover increased by passing a rapid current of the gas mixture over the catalysts, and subsequent rapid cooling, whereby complete reduction to methane is lessened and decomposition of the formaldehyde prevented.

As an example of carrying out my invention I prepare a suitable catalyst mixture of pieces of about the size of lead shot or peas and compress the gas by a compression pump into the reaction vessel under a pressure of about 10 atmospheres, the gases issuing from a small constriction to promote rapid cooling on passing into water scrubbers for the purpose of removing the formaldehyde.

The gas is forced through the catalyst at an initial temperature of 300° C.—400° C. and as rapidly as will ensure that the temperature does not fall below 160° C.—180° C. as is measured by a thermometer placed immediately beyond the catalyst.

In order to restore the activity of the hydrated metal oxide steam is blown through the catalytic mass or, preferably, mixed with the gaseous mixture to maintain the catalytic activity, in which latter case a somewhat higher temperature must be used, and any methyl alcohol produced by excess of steam can be readily oxidised to formaldehyde by known processes.

The residual gas, after washing, contains a large percentage of methane and hydrogen, and a correspondingly small percentage of carbon monoxide and is therefore of commercial value as an illuminating gas. By the adoption of the aforesaid process and the incidental purification of the gas and consequent enhanced value thereof the cost of production of the formaldehyde and its condensation and polymerisation products is materially lessened.

In carrying out the above described process I have used a mixture of 4 parts nickel 1 part copper and 5 parts alumina. It is understood that other metals may replace the nickel or copper and other hydrated oxides, especially the rare earths, may replace alumina. Moreover, according to the conditions of temperature, rate of flow of gas and nature of catalysts used, the formaldehyde can be obtained polymerised according to the many well known forms in which formaldehyde is known to condense.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

The production of formaldehyde and its polymers from mixtures of carbon monoxide and hydrogen by the use of an intimate mixture of a hydrogen activating catalyst and a hydrated metal oxide, the catalytic activity of which is maintained by the use of steam admitted periodically during the reaction process or preferably by the addition of steam to the gas mixture to be treated.

Dated this 5th day of December, 1921.

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